

CLAIMS

What is claimed is:

1. A method comprising:

5 for each input of a plurality of inputs of a switch: generating a request to send a packet to one of a plurality of outputs of the switch from said input, said generating the request including weighted randomly selecting one of the plurality of outputs of the switch to which said input has a packet to send;

granting one of said requests for each different one of the plurality of outputs for which one or more of said requests were generated; and

10 sending packets between said inputs and said outputs corresponding to said granted requests.

2. The method of claim 1, wherein a round consisting of said generating the request, said granting one of said requests, and said sending packets is performed at least two times per packet time, said packet time corresponding to the amount of time allocated
15 to receive a packet at an input of the switch from an external source.

3. The method of claim 2, comprising configuring the switch to setup connections between said inputs and said outputs corresponding to said granted requests prior to said sending packets.

4. The method of claim 1, wherein said granting one of said requests includes
20 randomly selecting one of said requests for each of the plurality of outputs for which one or more of said requests were generated.

5. The method of claim 1, wherein said weighted random selection is weighted based on a number of packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

6. The method of claim 1, wherein said weighted random selection is weighted based on a number of bytes to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

5 7. The method of claim 1, wherein said weighted random selection is weighted based on the last times packets were sent from a corresponding input of the plurality of inputs to each of the plurality of outputs.

8. The method of claim 1, wherein said weighted random selection is weighted based on classes of service associated with packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

10 9. The method of claim 1, wherein said weighted random selection is weighted based on at least two items from a group consisting of: (a) the number of packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs, (b) the number of bytes to send to each of the plurality of outputs by a corresponding input of the plurality of inputs, (c) the last times packets were sent from a corresponding input of
15 the plurality of inputs to each of the plurality of outputs, and (d) classes of service associated with packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

10. The method of claim 1, comprising one or more rounds of generating requests by weighted randomly selecting among all or a subset of the plurality of outputs, and
20 selectively granting said requests corresponding to available bandwidth after said generating the requests for each input and said granting one of said requests and before said sending packets.

11. An apparatus, comprising:

a plurality of request generators;

one or more grant arbiters coupled to the plurality of request generators;

wherein each of the plurality of request generators is configured to weighted

5 randomly generate a request for its associated input of a plurality of inputs of a switch, the request including a weighted random selection of one of a plurality of outputs of the switch;

wherein said one or more grant arbiters are configured to grant requests received from the plurality of request generators such that one request for each requested output is
10 granted; and

wherein the plurality of inputs are configured to send packets corresponding to said granted requests.

12. The apparatus of claim 11, comprising a control to configure the switch to setup connections between said inputs and said outputs corresponding to said granted
15 requests.

13. The apparatus of claim 11, wherein said one or more grant arbiters randomly select a request to grant for a particular output from said requests received for the particular output.

14. The apparatus of claim 11, wherein said weighted random selection is
20 weighted based on a number of packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

15. The apparatus of claim 11, wherein said weighted random selection is weighted based on a number of bytes to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

16. The apparatus of claim 11, wherein said weighted random selection is weighted based on the last times packets were sent from a corresponding input of the plurality of inputs to each of the plurality of outputs.

5 17. The apparatus of claim 11, wherein said weighted random selection is weighted based on classes of service associated with packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

10 18. The apparatus of claim 11, wherein said weighted random selection is weighted based on at least two items from a group consisting of: (a) the number of packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs, (b) the number of bytes to send to each of the plurality of outputs by a corresponding input of the plurality of inputs, (c) the last times packets were sent from a corresponding input of the plurality of inputs to each of the plurality of outputs, and (d) the classes of service associated with packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

15 19. The apparatus of claim 11, wherein the plurality of inputs are configured to send packets from their respective virtual output queues corresponding to said granted requests.

20 20. The apparatus of claim 19, wherein the apparatus includes a plurality of line cards and a switching board including the switch, and wherein said virtual output queues are located on the line cards.

21. The apparatus of claim 19, wherein the apparatus includes a plurality of line cards and a switching board including the switch, and wherein said virtual output queues are located on the switching board.

22. An apparatus comprising: ✓

means for generating requests to send packets to outputs of a switch from input inputs of the switch, said means for generating said requests including means for weighted randomly selecting, for each of said inputs having a packet to send, one of said
5 outputs of the switch to which said input has a packet to send;

means for granting one of said requests for each different one of the plurality of outputs for which one or more of said requests were generated; and

means for sending packets between said inputs and said outputs corresponding to said granted requests.

10 23. The apparatus of claim 22, comprising means for configuring the switch to setup connections between said inputs and said outputs corresponding to said granted requests prior to said sending packets.

24. The apparatus of claim 22, wherein said means for weighted randomly selecting includes means for determining a weight based on a number of packets to send
15 to each of said outputs by a corresponding input.

25. The apparatus of claim 22, wherein said means for weighted randomly selecting includes means for determining a weight based on the last times packets were sent from a corresponding input of the plurality of inputs to each of the plurality of outputs.

20 26. The apparatus of claim 22, wherein said means for weighted randomly selecting includes means for determining a weight based on the classes of service associated with packets to send to each of the plurality of outputs by a corresponding input of the plurality of inputs.

27. A method for scheduling packets, the method comprising:
for each particular input of a plurality of inputs: generating a first request
including weighted randomly selecting one of a plurality of outputs;
granting one of said first requests of the plurality of outputs for each different one
5 of the plurality of outputs for which one or more of said first requests was generated;
for each particular input of the plurality of inputs whose first request was not
granted: generating a second request including weighted randomly selecting one of the
plurality of outputs; and
granting one of said second requests of the plurality of outputs for each different
10 one of the plurality of outputs not already having a corresponding first request granted
and for which one or more of said second requests was generated.

28. The method of claim 27, wherein said weighted random selection is weighted
based on the number of packets or bytes to send to each of the plurality of outputs by the
corresponding input.

15 29. The method of claim 27, wherein packets are sent between said inputs and
said outputs based said granted first and second requests.

30. The method of claim 27, wherein only two request phases are performed per
packet time, said two request phases consisting of said generating said first requests and
said generating said second requests, said packet time corresponding to the amount of
20 time allocated to receive a packet at an input from an external source.

31. The method of claim 27, wherein each particular request to grant of said first
requests and said second requests for each particular output is randomly selected from all
the respective said first requests or said second request for said particular output.

32. An apparatus, comprising: /
a plurality of request generators;
one or more grant arbiters coupled to the plurality of request generators;
wherein each of the plurality of request generators is configured to weighted
5 randomly generate a first round request and as required a second round request for its
associated input of a plurality of inputs of a switch, the first round request includes a first
weighted random selection of one of a plurality of outputs and the second round request
includes a second weighted random selection of one of the outputs if the first round
request was not granted; and
10 said one or more grant arbiters are configured to grant requests received from the
plurality of request generators such that one request for each requested output in the first
round of requests is granted, and one request for each requested output in the second
round of requests is granted if a grant for said requested output was not generated for a
request in the first round of requests.
- 15 33. The apparatus of claim 32, wherein said one or more grant arbiters randomly
select a request to grant for a output from the set of requests received for the output.
34. The apparatus of claim 32, wherein said weighted random generation is
weighted based on the number of packets or bytes to send to each of the plurality of
outputs by the corresponding input.